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TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

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COLEOPTERA ASSOCIATED WITH CULTIVATED FRUITS.

By A. M. MASSEE, D.Sc.
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During recent years a number of articles have been published which treat of some of the Coleoptera associated with top and soft fruits. Nearly all of them, however, concern a few very destructive species which are dealt with in great detail, whilst many more species—which cannot be considered economic—are not mentioned at all. Nevertheless, some very interesting beetles occur in the extensive fruit-growing areas of Kent, the West of England, Cambridgeshire, the Eastern Counties and elsewhere.

About seventy species of Coleoptera occur on the various sorts of fruits grown in this country, of which a few are found exclusively on apple, pear, plum, etc., but the majority have other host-plants besides cultivated fruits.

Although the number of species recorded on fruit has not varied to any extent during the past forty years, it is of interest to note that a few species are more plentiful now than formerly. The reason for this is not clear. It may be due to the modified methods of cultivating the plantations, and to the intensified spraying programme which is practised to-day. Or it may be due to the fact that in certain fruit-growing counties wide areas are devoted entirely to the cultivation of fruit, and that in such districts a few of the insects present have become accustomed to feeding on the more common fruits.

The most striking example is to be found in the weevil, *Rhynchites aequatus* L. The normal host-plant of this insect is hawthorn. It is abundant in the South of England, where it feeds on the leaves of hawthorn in the latter part of April, May

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and June, and later on deposits its eggs in the developing fruits. Ten years ago this weevil was found on apple at Swanley, but it was by no means common. Since that time it has gradually increased in numbers, and now it occurs commonly each year in apple plantations in all parts of Kent. It also attacks plums in some districts.

The adult weevil attacks the apple fruitlets when they are quite small (about two weeks after petal-fall) and makes little punctures in the flesh of the apples with its proboscis. Eggs are sometimes deposited in the holes, but this is not usual. The fruits become distorted as they swell out, and are unsuitable for market.

Twelve species of beetles can be regarded as serious pests, most of which turn up in the orchard each year with marked regularity. In addition, a few other species are sometimes troublesome, but the outbreaks are more localised and the damage less severe. The important economic species are as follows: — *Byturus tomentosus* F., Raspberry Beetle; *Nebria brevicollis* F., Strawberry Seed Beetle; *Rhynchites aequatus* L., Apple Fruit Rhynchites; *Otiorrhynchus clavipes* Bonsd., Red-legged Weevil; *O. singularis* L., Clay Coloured Weevil; *O. sulcatus* F., Vine Weevil; *Melolontha melolontha* L., Cock-chafer; *Anthonomus pomorum* (L.) Curt., Apple Blossom Weevil; *A. rubi* Hb., Strawberry Blossom Weevil; *Psylliodes attenuata* Koch., Hop Flea Beetle; *Scolytus mali* Bechst, Large Fruit Bark Beetle; and *Anisandrus dispar* F., the Shot Hole Borer.

Some of the rarer beetles associated with fruit are of special interest to the collector, but unfortunately only a limited number are found in this country. The following, however, are worthy of mention: — *Gnorimus nobilis* L., *Opilo mollis* L., *Obrium cantharinum* L., *Acmaeops collaris* L., *Lyctus linearis* Gy., *Anthonomus cinctus* Redt., *A. humeralis* Panz. and *Magdalis barbicornis* Latr. *Rhynchites bacchus* L. would have been included some years ago, but the chances of it turning up again in the Kentish plantations seem to be remote.

The modern methods of growing fruit differ very considerably from those practised even a few years ago, and thus the general conception of an orchard, for example, must now be modified considerably. The old grass orchard, containing a few dilapidated trees of various varieties of cider apple, so familiar in parts of the west of England, is by no means representative of the orchard or plantation where fruit is cultivated on a large scale to-day. The trees in a modern plantation are evenly spaced, at sufficient distance to allow plenty of room for each, and pruning operations are carried out each winter. In addition, spraying has become a matter of routine, and many orchards receive five or six applications each season. The soil is often

cultivated, but many grass orchards are still to be found in some districts.

In this article it is proposed to mention the species of beetles which are definitely associated with cultivated fruits. In other words, those which feed on the foliage or fruit, the stem- and wood-boring species, and a few predacious insects.

A number of other species may be found from time to time, but since they do not actually feed on the foliage or fruit, they will not be referred to at all.

The Coleoptera associated with Cultivated Fruits.

Carabidae.

Nebria brevicollis F. Strawberry Seed Beetle.
Ophonus pubescens Mull.
Pterostichus cupreus L.
P. madidus F.
P. vulgaris L.
Abax ater Vill.

Although the Carabid beetles are generally regarded as beneficial insects, both in their adult and larval stages, under certain circumstances the adults of six species often cause severe injury to strawberry fruits during the latter part of May and in June. The most important species is *N. brevicollis,* which removes the seeds of the ripening fruits. Another very destructive species, more particularly in the West of England, is *O. pubescens*. The other four species referred to above are often very troublesome in some seasons.

The Carabid beetles feed at night and destroy the fruits by removing the seeds or particles of flesh, causing the fruits to go rotten prematurely. The damage is similar to that caused by the Strawberry Slug and is often confused with it.

Staphylinidae.

Although a very large proportion of the British Coleoptera are contained in the family Staphylinidae, it is curious that none of them is directly connected in any way with cultivated fruits. A few species of *Atheta* and *Anthobium* may be seen wandering about in the flower trusses of apple, pear, plum and cherry trees in the spring time, but they do not form part of the usual fauna.

Coccinellidae.

Adalia bipunctata L. Two-spot Ladybird.
Coccinella 7-punctata L. Seven-spot Ladybird.

Nitidulidae.

Meligethes aeneus F.
Librodor hortensis Fourc.

Lathridiidae.

Enicmus transversus Ol.
Corticaria elongata Gyll.
Corticarina gibbosa Hb.

Byturidae.

Byturus tomentosus F. Raspberry Beetle.

Cryptophagidae.

Micrambe vini Panz.
Atomaria linearis Steph. Pigmy Mangold Beetle.

Most of the Clavicorns occurring on fruit are beneficial species.

A. bipunctata and *C. 7-punctata* are abundant everywhere on fruit trees and bushes during the spring and summer months, and being predacious in both their larval and adult stages, they help materially in reducing the vast aphid population which infest the trees. The larval stages are known as 'niggers' by the fruit grower.

M. aeneus, E. transversus, C. elongata, C. gibbosa, M. vini and *A. linearis* occur annually in the blossoms of apple, pear, plum, cherry and other fruits, and thus may be regarded as beneficial insects since they assist in pollinating the various sorts of fruits. These insects are of the greatest value when it is cold and sunless during the blossom period, since they continue to pollinate the flowers when it is too cold for hive-bees to work freely. It should be noted that *A. linearis* is regarded as a beneficial insect by the horticulturist, whilst it is recognised as being a very serious pest of root crops by the agriculturist.

L. hortensis associates itself with rotten apple fruits which fall from the trees in August and September. Also it is usually found in the fruits which have been infested previously by Codling Moth larvae. It is not commonly found in the apple plantation, but occurs locally in the Maidstone district of Kent.

B. tomentosus is doubtless one of the most important pests of soft fruits. The larva infests the fruits of raspberry, loganberry and cultivated blackberries. Since the advent of the canning industry in this country, this insect has become still more important, since it is imperative to can unblemished fruits, and not those infested by the larvae of this Clavicorn.

The Raspberry Beetle hibernates as an adult in a small earthen cell, amongst the roots of the various *Rubus* upon which it feeds. It emerges in the latter part of April or early May, and then visits the flowers of various plants and trees prior to returning to the raspberry for the purpose of depositing its eggs in the flower trusses and on the immature fruitlets.

Lucanidae.

Lucanus cervus L. Stag Beetle.

Dorcus parallelopipedus L.
Sinodendron cylindricum L.

SCARABAEIDAE.

Amphimalus solstitialis L. Summer Chafer.
Melolontha melolontha L. Cockchafer.
Phyllopertha horticola L. Garden Chafer.
Cetonia aurata L. Rose Chafer.
Gnorimus nobilis L.

Although eight species of Lamellicorns are found on various kinds of fruits, only three of them are recognised as harmful species, and then only occasionally.

The larval stages of *L. cervus, D. parallelopipedus* and *S. cylindricum* are sometimes found tunnelling in the trunks of cherry, but they generally occur in old and neglected trees and those in a weak state of growth. *L. cervus* has been found boring into the roots of old apple trees in Somersetshire.

Three species of Scarabaeids, namely, *M. melolontha, P. horticola* and *A. solstitialis* are sometimes very prevalent in fruit plantations, and in some seasons they are very destructive. Both the adult and the larval stages are harmful. The adults of the three species, but more particularly of *M. melolontha,* cause much damage by feeding on the young apple fruitlets during June, and in some instances several acres of fruit have been destroyed. In recent years bad outbreaks have been noted in various parts of Kent, Surrey and Hampshire.

Although the larvae of these Chafer beetles are usually found in grass-land, they also occur in cultivated fields and are frequently very destructive to the roots of the strawberry, raspberry and other soft fruits. The roots of newly planted apple trees are also subject to attack.

C. aurata, the Rose Beetle, is very destructive to the flowers of roses, but it is by no means confined to this plant. The larva destroys the roots of strawberry and raspberry plants, and in 1932 this insect was very destructive to some young apple trees growing in a garden at Dover. The damage caused by this Chafer to strawberries has been reported also from Hampshire and Worcestershire in recent years.

G. nobilis is the least common Lamellicorn found in the orchard, but it turns up from time to time, and it is probably more common than it is generally presumed to be. The larva may be sought in the partly decayed trunks of old plum and damson trees. It feeds upon the decayed wood mould which collects within the hollowed stems. The larva breeds readily in captivity when kept in a metal box containing moist wood mould. The adult is attracted to wild and cultivated flowers in June.

In the past few years specimens have been captured in Kent at East Malling, East Farleigh, Snodland and Ashford.

ELATERIDAE.

Adrastus nitidulus Marsh. Click Beetle.

Several species of Elaterids are destructive to cereals and root crops, but only one is troublesome to the fruit grower.

A. nitidulus is destructive in its larval stage to the roots of cultivated strawberries, and frequently ruins the whole bed in the garden and in the field. It is widely distributed and may be found in the important strawberry growing districts of Botley, Hampshire; Wisbech, Cambridgeshire; and Swanley, Kent.

CLERIDAE.

Opilo mollis L.

The larval stage of this beetle is predacious on certain wood-boring beetles, and it frequents old apple and plum orchards where *A. dispar* and *S. mali* are infesting the stems and branches. The adult of *O. mollis* may be found on the trees in June and July, but it is likely that it is largely overlooked since it is nocturnal in his habits.

LYCTIDAE.

Lyctus linearis Gyll.

The more usual host of this wood-boring beetle is oak, but until comparatively recently it occurred commonly in the chestnut 'pole work' of the hop gardens. To-day the 'wire work' system of training hops has superseded the old 'pole work' method, and in consequence *L. linearis* is less common now than formerly.

PRIONIDAE.

Prionus coriarius L.

CERAMBYCIDAE.

Clytus arietis L. Wasp Beetle.
Obrium cantharinum L.
Acmaeops collaris L.

LAMIIDAE.

Pogonochaerus hispidulus Pill.
Tetrops praeusta L.

Five species of Longicorns have been noted infesting the trunks of fruit trees, and one breeds in the chestnut poles of the hop-gardens.

P. coriarius, C. arietis and *P. hispidulus* have been bred from the trunks of apple, plum and cherry and are locally common in Kent. *Prionus* is found occasionally boring into the roots of cherry, which it readily destroys.

T. praeusta is commonly found feeding upon the leaves of apple, plum and pear during June on warm, sunny days. The larva tunnels in the tips of the dead and dying shoots. It has not been noted boring into the healthy growths. This Longicorn occurs commonly on old pear trees in London gardens.

O. cantharinum is one of the rarer British Longicorns, and a number of specimens were bred out of aspen many years ago by Dr. Power. About sixteen years ago the late Professor Theobald found a large number of adults and larvae infesting an old apple tree growing in an orchard near Ashford, Kent. It is possible that this beetle still exists in some of the old apple orchards in Kent, but so far it has not turned up again in spite of diligent searches.

A. collaris was formerly quite common in the Kentish hop-gardens, especially in those where the 'pole work' system of training the hops was used. It is less common now that the 'wire work' system is in general use. The larva bores into the chestnut poles; while the adult may be found on the wild flowers growing on the headlands of the garden during the flight period of the beetle during the summer months.

CHRYSOMELIDAE.

Galerucella tenella L. Strawberry Leaf Beetle.
Batophila rubi Payk.
B. aerata Marsh.
Derocrepis rufipes L.
Chaetocnema concinna Marsh. Brassy Tooth-legged Flea Beetle.
Psylliodes attenuata Koch. Hop Flea Beetle.

Very few species of Phytophagous beetles are associated with fruit, and considering their economic importance on agricultural crops this fact is somewhat curious.

Both the larva and the adult of *G. tenella* feed upon strawberry foliage in July, and when the infestation is severe the vigour of the plants is much reduced. The head-quarters of this insect on fruit appears to be Hampshire. It has not been recorded on strawberry in Kent.

B. rubi and *B. aerata* may be found on the foliage of raspberry and blackberry during the summer months, but *B. aerata* is the less common of the two.

D. rufipes is not usually found on fruit trees, but in some seasons the adults feed freely on apple foliage. It was abundant in apple orchards in the Sittingbourne district of Kent in 1937.

C. concinna has a wide range of host-plants, but the only fruit it appears to infest is the strawberry. It may be found feeding upon the upper surface of the foliage during the summer months. Although it is frequently very abundant, it is not considered a harmful species. Fowler (1) and Theobald (2) mention the hop as being a host-plant of this flea-beetle. These records, however, are not correct. The biology and host-plants of this insect have been studied in detail by Newton (3).

P. attenuata, the Hop Flea Beetle, is familiar to hop growers throughout the country. The adults attack the young leaves of

the bine during May, causing severe damage by skeletonizing the foliage, especially in seasons when the growing conditions are bad and the hops are unable to make their normal growth.

TENEBRIONIDAE.

Cylindronotus laevioctostriatus Goeze.

MORDELLIDAE.

Anaspis humeralis F.

The Heteromerous beetles are very poorly represented, only two species being recorded.

C. laevioctostriatus occurs on apple and plum trees during the autumn months. The adults are nocturnal in their habits, and may be found wandering about the stems of the trees in large numbers. Their association with the trees — if any — has not been ascertained, but it is curious that they should persist year after year without some definite reason.

A. humeralis occurs abundantly during the blossom period in the flowers of apple, pear, plum, etc. It assists in the pollination of the flowers in company with the Clavicorn beetles referred to previously.

CURCULIONIDAE.

Rhynchites bacchus L.
R. aequatus L. Apple Fruit Rhynchites.
R. minutus Herbst. (=*aeneovirens* Marsh.).
R. coeruleus De Geer. Apple Twig Cutter.
R. germanicus Hb.
Otiorrhynchus clavipes Bonsd. Red-legged Weevil.
O. rugosostriatus Goeze.
O. ligneus Ol.
O. singularis L. Clay-coloured Weevil.
O. sulcatus F. Vine Weevil.
O. ovatus L.
Strophosomus melanogrammus Forst.
Barypithes araneiformis Schrk. Strawberry Fruit Weevil.
Nemoicus oblongus L. Brown Leaf Weevil.
Phyllobius calcaratus F. Leaf Weevil.
P. pyri L. Common Leaf Weevil.
P. maculicornis Gmel. Green Leaf Weevil.
Epipolaeus caliginosus F.
Mecinus pyraster Hb.
Anthonomus cinctus Redt. Apple Bud Weevil.
A. pomorum (L.) Curt. Apple Blossom Weevil.
A. humeralis Panz.
A. rubi Hb. Strawberry Blossom Weevil.
Balaninus nucum L. Nut Weevil.
Magdalis cerasi L.
M. pruni L.
M. barbicornis Latr.

Most sorts of top and soft fruits are subject to attack by one or more species of weevil, and some species cause severe damage to the trees with marked regularity each season. *A. pomorum, R. aequatus, A. rubi, O. singularis* and *O. clavipes* may be regarded as the most important economic species. It is of interest to note that the genus *Apion* is very badly represented; one or two of the clover species feed on apple foliage, but this must be regarded as exceptional. Also the members of the genus *Sitona* are seldom noted, and it cannot be said that any one of them is definitely associated with fruit.

R. bacchus is extremely rare in this country, and it is no longer regarded as British by some authorities. The host-plants of this very handsome weevil are said to be various kinds of fruit trees, including apple. It was formerly captured in Kent, at Crayford and Birch Wood. It is still to be found on fruit trees in Germany, but in that country it is far from common.

Four more species of *Rhynchites* are commonly found in fruit plantations, and the damage they cause is often very serious. *R. aequatus,* which is the most important, destroys the apple fruitlets by puncturing them with its rostrum. It also lays its eggs in the flesh of the fruits. *R. coeruleus* causes damage by biting through the twigs of the new growths of apple, causing them to wilt and eventually fall off. A single egg is deposited in the part of the shoot which is cut off, and the larva develops within the dead shoot, which sooner or later falls to the ground. *R. minutus* and *R. germanicus* occur on the strawberry during the spring, and damage the plants by biting through the petioles of leaves and flower trusses. Both species are locally common in parts of Kent and Hampshire. *R. germanicus* also feeds upon the new growths of cultivated blackberry, and causes characteristic injury by biting through the tips of the shoots.

O. singularis and *O. clavipes* are very prevalent in fruit plantations, more particularly early in the spring months, when they infect a wide range of fruits indiscriminately. Much damage is done by the adults feeding on the young growths of apple, pear, plum and black currant. They actually feed on the bark, often completely girdling the stems. Both species cause severe injury by eating the buds of the scions of newly grafted fruit trees. The larvae of these two species feed on the roots of strawberry and raspberry, and are frequently very troublesome in newly planted fields. *O. singularis* is widespread in most fruit-growing districts, but *O. clavipes* chiefly occurs in districts on or near chalky formations.

O. rugosostriatus, O. ligneus, O. sulcatus and *O. ovatus* are more common in some seasons than others, and when abundant their larvae are very destructive to the roots of strawberry and raspberry. In recent years these species have been very harm-

ful in the Botley district of Hampshire, and are frequently noted in other parts of the country as well. *O. sulcatus* is the well-known Vine Weevil which causes so much damage to plants and vines growing under glass.

S. melanogrammus feeds upon the cultivated nut in addition to the hazel, and is regarded as one of the commonest British beetles. The damage it causes to nuts, however, is negligible.

B. araneiformis is locally common in June in some of the strawberry growing districts of Kent and Cambridgeshire. It nibbles the immature fruits, rendering them unfit for market.

Four species of *Phyllobius* are very plentiful on fruit trees for a short period during the latter part of May and early June. They are as follows: *N. oblongus, P. calcaratus, P. pyri* and *P. maculicornis*. They are all leaf-eating species which infest most sorts of top and soft fruits. The adults appear in vast numbers at the time when most commercial apples are in full blossom, and they swarm over the trees feeding on leaves and flowers indiscriminately. Fruit growers are frequently alarmed by the presence of these insects, but in actual fact they very rarely cause any serious trouble. Sometimes newly planted trees and apple stocks receive a check when completely defoliated, but damage of this nature is not usual.

E. caliginosus cannot be considered an uncommon weevil, but very little appears to be understood about its life-cycle. It is of interest to record, therefore, that the larva has been found tunnelling into the roots of hops, and in some instances the whole plant is destroyed. The larva of this weevil has been present in a hop garden in Worcestershire since 1929, and the damage caused by it seems to be more serious each year.

M. pyraster feeds on apple and pear foliage in the spring, but it is not regarded as a common or important insect.

A. cinctus has been recorded in Kent at East Malling and Swanley, and there is also one record from Darenth Wood (4). In addition, it is locally common in a few apple plantations near Cambridge. The complete life-cycle of this weevil is spent within the fruit buds of the apple, thus it is very likely to be overlooked by those not familiar with its habits. Eggs are laid singly in the fruit buds during February. The larva hatches the same month and feeds within the buds, frequently eating all but the shell. The pupal stage is passed in the hollowed-out bud. It extends over a period of six weeks. The adult emerges in the latter part of May. The infested buds are conspicuous in the spring, especially when the buds are opening and beginning to grow. Those attacked by the larva remain in a dormant condition, and if removed a small whitish-yellow larva will be found in each. If such buds are collected and placed in a tin containing moist sand, the adults can be reared without difficulty (5).

A. pomorum is abundant in all fruit-growing districts, and it is often very destructive in plantations where cordon and bush apples are grown. The weevil deposits its eggs singly in the fruit buds during the first or second week of April. The larva hatches just before the flowers are due to expand, and it feeds on the reproductive organs within the flower. This prevents the flower from opening. Instead it remains tightly closed and turns brown in colour. The infested flowers may be seen quite readily, and are often referred to by the grower by the appropriate name of 'Capped Blossoms.' The adult emerges in June, and feeds on the foliage for some time, and finally seeks shelter in the cracks of the bark, in the leaves in ditches and hedgerows, and in rough grass, etc. It aestivates during the summer months, and continues to hibernate throughout the winter.

A. humeralis is very similar to *A. pomorum* in appearance, but it is smaller, and the male genital organs are said to differ (6). It was found in some numbers in an apple orchard at East Malling, Kent, some fifteen years ago, but it has not been noted since in the same locality.

A. rubi is known by the popular name of Strawberry Blossom Weevil or Elephant Beetle. It is sometimes abundant in the strawberry growing districts of Hampshire, but it is never very common in Kent. It occurs in the strawberry fields in April and May, and deposits its eggs singly in the unopened flowers, through a puncture made by the rostrum. The next operation is partially or completely to sever the bud stalk, which prevents further development of the unopened flower. In some seasons the above type of injury may be very serious. This weevil also infests cultivated and wild blackberry, and also the raspberry.

B. nucum is always present in the cob-nut growing district of Kent, but it is not regarded as an important insect.

M. pruni, M. cerasi and *M. barbicornis* are sometimes found feeding on the leaves of apple, pear, plum and cherry, but none of them is ever very numerous. *M. barbicornis* has been causing a good deal of damage to William pears in the Channel Islands in recent years. The larva bores into the stems and branches, causing the small limbs to die back, thus reducing the vigour of the trees. This insect has been found on pear trees at East Malling, Kent, and a few years ago it was found on a medlar tree growing in a garden in Cambridgeshire.

IPIDAE.

Scolytus mali Bechst. Large Fruit-bark Beetle.
S. rugulosus Ratz. Fruit-bark Beetle.
Anisandrus dispar F. Shot Hole Borer.
Xyleborus saxeseni Ratz. Flat-celled Shot Borer.

The four species of Scolytids associated with fruit trees are locally abundant in most fruit-growing areas, and they are

nearly always present when the trees are in an unhealthy condition and are growing in water-logged soil. The apple, pear, plum and cherry are the chief hosts, and the attack is mainly confined to the trunks and the larger branches. *A. dispar* is the commonest species on fruit, and the male, which is usually regarded as a rarity, should be sought for in the months of December, January and February, when it is frequently very abundant.

A. dispar was discovered infesting the bines of the Himalaya blackberry growing in a plantation in West Sussex. This host, however, would seem to be a very unusual one.

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